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Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV)

Availability:	**Please visit this website for more information about the instrument:** **Wechsler Adult Intelligence Scale-Fourth Edition Link**
Classification:	**Supplemental**: Epilepsy, Mitochondrial Disease (Mito.), Stroke, and Traumatic Brain Disease (TBI)
Short Description of Instrument:	**WAIS-IV subtests:** Arithmetic Block Design Comprehension Digit Span Digit Symbol Information Letter-Number Sequencing Matrix Reasoning Picture Arrangement Picture Completion Processing Speed Object Assembly Similaraties Symbol Search Vocabulary **Publication Date:** 2008 **Ages / Grades:** Individuals 16-90 years **Completion Time:** 60-90 minutes **Scores:** VIQ, PIQ, and FSIQ scores

Block Design Subtest: Epilepsy	**Formal IQ Testing** The WAIS-IV was released in 2008, and there are presently no peer-reviewed clinical studies of the WAIS-IV in epilepsy. Historically, the natural evolution for adopting new psychological tests following their revision occurs over an approximate 5-year transition period. For studies using Wechsler short forms derived from either the WASI or WAIS-IV/WISC IV, the committee recommends, at a minimum, including the Vocabulary and Block Design subtests. Similarly, the committee recommends that the General Ability Index be calculated when the full WAIS-IV/WISC-IV is administered to facilitate comparisons with the FSIQ obtained with the WASI. **Visuospatial (Optional Domain)** Spatial skills, to date, have not been a primary interest in most epilepsy studies. Other than improvement following contralateral/dominant hemisphere surgery, visuospatial performances tend to remain stable. In addition, there is greater variability in tests used to measure visual spatial abilities compared to language measures (e.g., Judgment of Line Orientation, Visual Object and Space Perception, Rey-Osterreith Complex Figure copy). Rather than recommend an additional test to the CDE neuropsychology protocol, the committee is cognizant of the fact that in most cases, Block Design will be administered as part of the Wechsler IQ testing. Consequently, when an individual visual spatial task is needed, performance on the Block Design subtest can be used. For studies using the WAIS-IV, the Perceptual Reasoning Index (PRI) derived from performances on Block Design, Matrix Reasoning, and Visual Puzzles can be present. If the WASI has been used, then the PIQ, which is analogous to the WAIS-IV PRI given the absence of tests of processing speed, can be reported. **Recommended Tests:** Block Design, WAIS-IV Perceptual Reasoning Index
Digit Span Subtest: TBI	**DESCRIPTION** Two sections: Digits Forward and Digits Backward **PERMISSIBLE VALUES** Raw score: 0-30 Scaled Score: 1-19. **PROCEDURES** Administered verbally. Requires minimal training. Administration time is 10 minutes. **COMMENTS** Adults 16-89 **RATIONALE** The Digit Span subtest is a widely used measure of auditory attention that is well-normed and sensitive to the effects of TBI **REFERENCES** Wechsler D. (1997). Wechsler adult intelligence scale-III. New York: Psychological Corporation.

Digit Span Subtest: Epilepsy	**Simple Span of Attention** **Purpose:** To assessment immediate attention **Alternative Languages**: Spanish **Comment:** The Digit Span test differs based upon which age-appropriate measure is used. The WISC-IV assesses forward and backward digit span. The WAIS-IV also includes a Sequencing trial in which the subject is the repeat back the digits in ascending order. Nationally-representative norms are available for 16-90 (WAIS-IV) years. WAIS-IV test booklets are copyrighted and can be purchased separately from the test publisher. Permission to photocopy single pages of the booklets for an annual fee can also be arranged with the publisher. In addition to normative values, span length (maximum longest digit span) should be reported separately for forward span and backward span. Individual standard scores for sum of correct trials for forward digits, backward digits, and sequencing should also be included. For studies relying on the WAIS-IV for IQ assessment, Digit Span will be obtained as part of the WAIS-IV protocol. **Primary Dependent Measures:** Digit Span Forward (scaled score), Digit Span Backward (scaled score) **Optional Secondary Measure:** Absolute span (largest number string) for forward span and digit span **Time Estimate:** 10 minutes **Scoring Estimate:** < 5 minute **Vendor:** Pearson/PsychCorp, P.O. Box 599700, San Antonio, TX 78259 **Spanish Reference**: Peña-Casanova, J, Quinones-Ubeda, S, Quintana-Aparicio, M, Aguilar, M, Badenes, D, Molinuevo, JL, et al. Spanish Multicenter Normative Studies (NEURONORMA Project): norms for verbal span, visuospatial span, letter and number sequencing, trail making test, and symbol digit modalities test. Arch Clin Neuropsychol, 2009; 24(4): 321-341.

Digit Symbol Subtest: Stroke	Purpose This test has been shown to predict group membership defined by processing speed deficits, such as brain-injured versus control samples[1] and has been used as a sensitive outcome in studies identifying predictors of longitudinal decline in elders[2]. Overview The digit-symbol subtest measures the time to recode symbol and digit items. The test requires elements of attention, visuoperceptual processing, working memory, and psychomotor speed. Time Assessment takes a few minutes to complete Scoring The score is the number correctly coded from 0-133 in 120 seconds. Psychometric Properties The test demonstrates strong reliability and validity coefficients . References DeMonte, VE, Geffen, GM, May, CR, & MacFarland, K. (2009). Improved sensitivity of the rapid screen of mild traumatic brain injury. J Clin Exp Neuropsychology, 6, 1-11. Knopman, DS, Mosley, TH, Catellier, DJ, Coker, LH, Atherosclerosis risk in communities study brain MRI study (2009). Fourteen-year longitudinal study of vascular risk factors, APOE genotype, and cognition: the ARIC MRI study. Alzheimer's & Dementia: the Journal of the Alzheimer's Association, 5, 207-214. Wechsler D. (1997). Wechsler adult intelligence scale-III. New York: Psychological Corporation.

Letter-Number Sequencing Subtest: TBI	**DESCRIPTION** This is a complex span task involving simultaneous processing. The subject is presented with a mixed list of numbers and letters and their task is to repeat the list by saying the numbers first in ascending order and then the letters in alphabetical order. **PERMISSIBLE VALUES** Performance on this measure is converted to scaled scores with a mean of 10 and standard deviation of 3. The scaled score is adjusted for age. **PROCEDURES** Requires trained examiner to administer. Administration time is 5 minutes. **COMMENTS** This is a performance based measure which requires the subject to understand what is required and participate in the testing. It requires a functional level in the severe disability or above on the GOS/GOSE. **RATIONALE** Highest factor analytic loading on Working Memory factor. Good psychometric properties and sensitivity to severity of TBI. Legacy measure for the NIH Toolbox Working Memory Subdomain. **REFERENCES** Wechsler Adult Intelligence Scale III. Letter-Number Sequencing Subtest. Pearson Education Inc, San Antonio, Texas.

Processing Speed Index Subtest: TBI	**DESCRIPTION** This index is based on 2 subtests of the Wechsler Adult Intelligence Scale. For Digit Symbol, examinee must accurately fill in symbols, according to matched number-symbol pairs in a key in 120 seconds. For Symbol Search, examinee determines whether either of two target symbols match any of the symbols in a search group; examinee must respond to as many items as able in 120 seconds. **PERMISSIBLE VALUES** The 2 subtests yield scaled scores adjusted for age with a mean of 10 and standard deviation of 3. The WAIS PS Index is based on the 2 subtests with a mean of 100 and standard deviation of 15 adjusted for age. **PROCEDURES** Requires trained examiner to administer and neuropsychologist or psychologist to interpret. Administration time is 10 minutes. **COMMENTS** This is a performance based measure which requires the subject to understand what is required and participate in the testing. It requires a functional level in the severe disability or above on the GOS/GOSE. **RATIONALE** Good psychometric properties. Sensitive to TBI and its severity. Legacy measure for NIH Toolbox Processing Speed Subdomain. **REFERENCES** Wechsler Adult Intelligence Scale III/IV. Processing Speed Index. Pearson Education Inc, San Antonio, Texas.
Symbol Search Subtest: Stroke	Purpose The symbol-search subtest of the WAIS III is an indicator of processing speed and visual perception. Overview The symbol-search subtest requires rapid identification of targets. Specifically, for each item the subject must search a series of five figures to see if either of two targets occur, and mark yes or no for each item. Recent fMRI findings have shown greater activity in the left dorsolateral prefrontal cortices associated with slower symbol search performance. This subtest and the Digit-Symbol subtest together comprise the Processing Speed Index of the WAIS-III. Scoring The score is the number correct in 120 seconds from 0-60. Time Assessment takes approximately 3 minutes. Psychometric Properties The subtest has shown validity in studies of adults with various neurological disorders.[2] References Sweet LH, Paskavitz JF, OConnor MJ, Browndyke JN, Wellen JW, Cohen RA (2005). FMRI correlates of the WAIS-III Symbol Search subtest. J of Int Neuropsychological Society, 11, 471-6. Wechsler D. (1997). Wechsler adult intelligence scale-III. New York: Psychological Corporation.

Specific for Mitochondrial Disorder	Strengths: As noted above, the Wechsler Adult Intelligence Scale has long been considered a gold standard instrument for assessing adult intelligence in both research and clinical settings. It is widely used, reliable and well validated. Previous versions of the WAIS have been used to characterize specific phenotypic characteristics of particular mitochondrial disorders. For example, relative weaknesses in nonverbal reasoning ability in individuals with POLG1 mutations and the syndrome of mitochondrial spinocerebellar ataxia and epilepsy (Gramstad et al., 2009), though results may have been impacted by psychomotor slowing. Similarly, previous versions of the WAIS have been used as sensitive measures of generalized cognitive decline in mitochondrial disorders as a whole (e.g., Finsterer, 2009). Limitations: There have not yet been studies published using the most recent revision, the WAIS-IV, in indiviudals with mitochondrial disorder, however it has been used in studies with populations that may present with similar characteristics like multiple sclerosis, with results demonstrating that the instrument as a whole is sensitive to measuring disease-related changes in cognition over time (e.g., Ryan et al, 2012). References Finsterer, J., (2009) Mitochondrial disorders, cognitive impairment and dementia. Journal of the Neurological Sciences 283: 143-148 Gramstad, A., Bindoff, L, Lillebo, A., Tzoulis, C. and Engelsen, B.A. (2009) Neuropsychological performance in patients with POLG1 mutations and the syndrome of mitochondrial spinocerebellar ataxia and epilepsy. Epilepsy and Behavior 16: 172-174 Ryan, J.J., Gontokovsky, S.T., Kreiner, D.S. and Tree, H.A. (2012). Wechsler Adult Intelligence Scale-Fourth Edition performance in relapsing-remitting multiple sclerosis. Journal of Clinical and Experimental Neuropsychology 34 (6), 571-579